Can we measure Microsoft's market power ?

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Summary

The aim of this paper is to try to measure the market power of Microsoft in the software industry. For this purpose, we developed a two time argumentation. First we measured the scale economies within this industry. Then we assumed the crude hypothesis that the results of a firm in this industry are linked to his size, according to the scale argument. We then compared expected profits and actual profits of Microsoft. The results tended to show that Microsoft have profits in excess of what a similar firm is expected to benefit from, if it does not have market power.

Key words: market power, software industry, scale economies, Microsoft.

Introduction

The aim of this paper is to try to measure the market power into the software industry. For this purpose, we imagined a two steps methodology. The first step consisted to identify and measure the main structural characteristic of the industry, if one emerges. Software being an immaterial good, it is natural to think that scales economies constitute this characteristic. The second step consisted in looking at the relations between different measures of profit and the scale of the sales, in this industry. We then put face to face expected and actual profits of Microsoft. We used a proprietary database on the 35 first companies of the industry for 10 years, based on annual reports and Form 10K (and 20F). This paper is divided in two sections: measure of the scale economies (1) and measure of the market power of Microsoft (2).

1) Scale economies in the software industry

The objective of this section is to try to measure scale economies in the software industry. It is obvious that scale economies exist because R&D spending and "sales and marketing" costs do appear as fixed costs. On the other side, weak (re)production costs (variable costs) strengthen scale economies. We put forward the hypothesis that scale economies are driven by demand and that we can speak of instant scalability[1] to name this kind of scale economies. Scale economies will then depend on the dynamic of demand and we need to measure them over a number of years**.** This is what we are going to do in this section knowing that, to our purpose, no work has been done on the

[1] *Cf.* Liebowitz & Margolis (2001).

software industry[2], contrary to what exists for many other sectors such as banks (Benson & *alii*, 1982), assurances (Katrishen & Scordis, 1998), food industry (MacDonald & Ollinger, 2000), network industries (Gathon, 1987), transports (Cowie & Riddington, 1996; Gagnepain, 1998), financial services (Leclerc et alii, 1999), etc.

a) Méthodology

The literature on scale economies is huge. We will present a synthesis of recent work, useful for our purpose. Scale economies do exist if (and only if) medium total cost of a company is growing slower than its output. A coherent representation of scale economies is given by the neo-classic production function of the form F(Yi, Xj) where the Yi are the outputs and Xj the inputs. Under certain conditions (Christensen & *alii*, 1973), the production process can be equivalently described by a cost function (dual):
C = G(Yi, Pk) where C represents total costs and Pk represents the prices of the Xj inputs (k = j). The conditions for this duality are that production factor's prices are exogenous for the firms and that the objectives of the latter are to minimise costs. This seems to be the case for the software industry.
The cost functions the most widely used are the classical Cobb-Douglas and the Translog (transcendental logarithmic production frontiers) promoted by Christensen & alii[3]. They are:

- Cobb-Douglas: lnC = a + b lnY + A + B + e where A represents inputs costs and B represents control variables and e a random error term.
- Translog: lnC = a + b lnY + c $(\ln Y)^2$ + A + B + e where A represents inputs costs also used in quadratic form including cross-variables multiplications and B represents control variables. These last ones are often omitted because the number of explanatory variables becomes quickly too high.

We are not going to choose the Translog but the Cobb-Douglas. There are many reasons. The first one is the parsimony principle. The second is that the theoretic advantages of the translog (« these functions provide a local second-order approximation of any production frontier. The resulting frontiers permit a greater variety of substitution and transformation patterns than frontiers based on constant elasticities of substitution and transformation », Christensen & alii, p. 28) can be cancelled by practical problems. The coefficients estimations are less precise and multicolinearity can be high (Webster & Scott, 1996). Let us add the difficulty of interpretation of the numerous coefficients. Clark & Speaker (1994) show that Translog has other drawbacks: it allows multiple outputs but is not estimated at the zero point. Another problem comes from the fact that with the Translog, one needs to evaluate for any output, the price of capital and the price of labour. These data are often not available and, in these cases, allocated in an arbitrary way that nullifies the interest of the translog. In fact, the differences between the estimates of the scale economies based on Translog or Cobb-Douglas are weak. McNutlty (2000) compared the two methods on a sample of 130 commercial banks over 5 years (from 1985 to

[2] Technical scale economies in software development have been checked. Banker & Kemerer, (1994) show a mix of economies and diseconomies of scale. Banker & Slaughter (1997) reach the same results on software maintenance.
[3] One has to quote the Léontieff function.

1989) and on the pooling of these five years. He also tested the fact of including or not interest costs in total costs. He obtained 12 results of scale economies for each method. 11 results gave differences of less than 1% and the last one a difference of 6%. We are going to follow Cowie & Riddington (1996) who tested a Translog function (« After some experimentation with the Translog, we came to the conclusion that there was no evidence that the higher order terms were significant », p. 1030), and use a Cobb-Douglas function. We reach the same conclusion after having made the same experiment.

b) Model specification

The model is expressed as:

$$Ln(TC) = a + bLn(GP) + cSoftwareRatio + dGPRatio + e$$

Where TC = total cost; GP = gross profit; SoftwareRatio = percentage of turnover realised in software; GPRatio = ratio of gross profit on employment.

Pre-packaged software firms usually do have two distinct outputs, software licences and support on one side and services on the other side. The turnover of these two activities is often available on Form 10K but we have neither the split of manpower between these two activities nor the split of capital use. In these conditions, it is not possible to identify a cost function of these two activities. We considered a unique output measured by the gross profit[4]. But we controlled for the output-mix by the variable SoftwareRatio. Concerning capital cost, the software industry is a light industry, fixed capital consisting mostly of microcomputers. With regard to price of labour, software firms are largely internationalised and have manpower in many countries. We included a control variable of the labour costs by the GPRatio. We tested nationality and the export ratio as independent variables but the results are not significant.

c) Data

We used a proprietary database on the 35 first firms of the software industry over 10 years from 1994 to 2003. It is based on annual reports and form 10K (or 20F). Are excluded because of lack of information, IBM, Fujitsu and SAS (it is not a public company) (table 1).

[4] The Cobb-Douglas function allows only one output.

Table 1 Data summary statistics (year 2000)

N=34	Total Costs	Gross Profit	SoftwareRatio (%)	GP/employment
Mean	1083	1653	75	182
Standard deviation	(1633)	(3579)	(14)	(84)
Median	8632	693	75	169

Millions of dollars and thousands of dollars by employee

d) Results

We evaluated the model over ten years from 1994 to 2003 with the OLS method. To have a better precision, we evaluated two years together each time. As scale economies vary from year to year, this method allows for smoothing differences for companies who have different fiscal years and can be confronted with different demands for the same reference year (table 2).

Table 2 Regression coefficients

Variables					
	2003/2002	2001/2000	1999/1998	1997/1996	1995/1994
Intercept	0.956	1.073	0.970	- 0.144	- 0.145
	(5.558)	(4.444)	(3.523)	(- 0.490)	(-0.741)
Ln(GP)	0.863	0.864	0.869	0.955	0.971
	(40.457)	(29.284)	25.871)	(27.802)	(38.733)
GPRatio	- 0.0007	- 0.0005	- 0.0007	- 0.002	- 0.001
	(- 2.594)	(- 1.433)	(- 1.710)	(- 3.817)	(- 2.253)
SoftwareRatio	- 0.0016	- 0.0038	- 0.0034	0.006	0.003
	(- 1.254)	(- 2.199)	(- 1.488)	(2.142)	(1.032)
N	62	64	66	51	41
R2	0.977	0.956	0.942	0.949	0.980
F	832	463	341	301	618

t-ratio in parentheses

The coefficient of Gross Profit is statistically significantly different than 0 at the 1 for 1000 level. The control variables can be significant but do not have influence on the results. The coefficient of Gross Profit being less than 1, economies of scale do exist. With the functional form we use, they are simply the inverse of that coefficient.

SCE (2003/2002) = 1.159
SCE (2001/2000) = 1.157
SCE (1999/1998) = 1.151
SCE (1997/1996) = 1.047
SCE (1995/1994) = 1.030

Quartile estimations do not change the picture. The estimation of the economies of scale on the first decile gives the result of 1.157. Scale economies do exist in the software industry but are far from the *radical scale economies* assumed by McKensie & Lee (2002) or Shy (2001) where all costs are considered as fixed (a constant). In fact, R&D costs and "sales and marketing" costs can be split in two parts, a fixed one and a variable one. Our empirical results tend to show that the variable part must not be forgotten. We build on theses measures of the economies of scale to analyse the market power in the software industry.

2) The analysis of market power in the software industry

The concept of market power is fundamental in industrial economics (Schmalensee & Willig, 1989; Scherer & Ross, 1990; Martin, 1993), but it is at the same time a very controversial question. The problem is to know and to verify if a firm's or firms' dominant position is due to higher efficiency or to market power exploitation. This section of the paper regroups three sub-parts: the first introduces the question of market power, the second presents data and statistical analysis of our measures of Microsoft's market power and the last one discusses some results of this work.

a) The market power question: an introduction

The identification of a market power is a prerequisite in any antitrust action. Market power is not punishable in itself, but it opens to the analyses of anti-competition practices. As there is no possibility for anti-competition practices without market power, this theme is strategic in all the antitrust cases. Nevertheless market power cannot be measured directly. Let us just introduce the point by presenting some arguments used for the Microsoft trial. The classical approach to market power is twofold:

On one side the measure of market shares is a good indicator of a "potential" market power. In this case the relevant question is the identification of the *relevant market.* This point is a real source of conflicts between the confronting parties. A good example is given in the U.S. *versus* Microsoft case, where the Government considered Microsoft in a monopoly position in the microcomputer based on Intel platform, because the firm had 95% of the market share (Gilbert & Katz, 2001). Microsoft, through the voice of Schmalensee (1999), defended the idea that competition on the microcomputer market was a competition between platforms and not between operating systems, where the platform concept included middleware and this last one included the browser Internet, Java etc. Schmalensee maintained that Windows suffered for the potential competition by present and future platforms. This was the reason why Microsoft had been obliged to tie operating software and browser[5]. Schmalensee maintained that competition is very high in the software for microcomputer and that the market positions are fragile. The economist referred to some examples such as word processor, spreadsheet and database. He specified that markets benefiting from network effects can be "winner takes all" markets, but that the induced monopoly positions are temporary[6]. The author specified finally that the competition toward Netscape had not an anti-competitive character and that it had

[5] For a different interpretation of this action of *tying* see Carlton & Waldman (2002).
[6] We will estimate the length of the "temporary" term later in our paper. In any case let's underline that Microsoft has had a dominant position in the operating system software for microcomputers for twenty years.

produced welfare effects for the consumers (in terms of lowering prices)[7]. The entry conditions aspect (did a firm raise entry barriers on its market segment?) is difficult to analyse too because identifying predatory pricing (Areeda & Turner, 1975, Baumol, 1996) is impeded by the problems of the choice and the measure of costs[8].

On another side, the pioneer works on industrial economics have developed an approach in terms of price/cost difference[9]. A firm which can establish, on a medium term, prices higher than its marginal costs (or average costs) enjoys market power. This market power can be found on its profit level. The measure problems are a large number, starting with the measure of costs we just underlined. These problems are even stronger in the software case. In fact the costs of embodied (re)production of these disembodied goods today are near to zero[10]. It doesn't follow that the marginal costs of sale of these goods are near to zero. But it seems likely to be more difficult to identify them than the marginal costs of embodied goods. One has to try to avoid measuring the marginal costs in the case of scale industries like the software industry.

The recent economic literature acknowledges the difficulty (even the impossibility) to measure the price/cost margin. Following Bresnahan (1989), the price/cost margin at present is no more considered a measurable data, but a variable to be estimated through econometric methods. The analyses concern then specific industries and require a specification of the competition conditions. These models are called "structural" by the economic literature and Bresnahan (1989) clarifies: "An advantage of the use of structural econometric models and explicit theories of industry equilibrium is that the class of models the data are allowed to treat is made explicit" (p. 1031). These models require putting together many data, because it is necessary to evaluate the curves of the supply, of the demand and to advance some behavioural hypotheses. There are also models which need a lower amount of data, the reduced form methods. Hyde & Perloff (1995), working through simulations on three main approaches, the structural model and two reduced forms by Panzar & Rosse (1987) and by Hall (1988), investigate their capacity of measuring market power. The authors show that the structural models are adequate to their aim and that the Hall's method is useful only when there are constant returns to scale, while the Panzar & Rosse model does not fit with the Cobb-Douglas standard specifications (of the production function). The authors' conclusion is that "The strength of the structural model is that it provides an estimate of market power, unlike the other two models" (p. 481).

Works on Microsoft are numerous too, but we found only one publication dealing with a direct measure of the firm's market power, Khan, Islam & Ahmed (2004). The authors use the Panzar & Rosse's model in its simplest version and they specify the

[7] Gasser & Allen (2001) develop the argument, about the ordered split-up of Microsoft by Judge Jackson, that "one monopoly is better than two", on the classical idea that a vertical monopoly charges only one monopoly profit instead of two if there are two firms (OS and application).

[8] Areeda & Turner (1975) proposed the average variable cost as a proxy of marginal cost to identify a predatory cost. Baumol (1996) suggested the average avoidable cost (marginal cost plus non-sunk product specific fixed costs). Let us note than in the case of Internet Explorer, Microsoft sponsorised the diffusion of this package through exclusive contracts with Internet access providers and personal computers manufacturers.

[9] See Werden (2001) and Reddy & alii (2001) for a presentation of the measuring problems applied to Windows case.

[10] Klein (2001) underlines this aspect, but he forgets, like other authors, that it is the marginal cost of sale and not the marginal cost of (re) production that is to be taken into consideration.

following function: $Q = A W^x I^y$ where Q is the output (the sales in this case), W is the labour cost (here the average wages in the software industry), and I is the interest rate. The period is 1994-2003 and quarterly data are used. But the model seems to be badly specified for an industry such as the software one. In fact the Microsoft's output depends mainly on the demand and not on the wages or even less on the capital cost: the capital depreciation cost is light in the software industry. Moreover, Microsoft has never used bank loans, having a very large availability of funds. The authors use a Cobb-Douglas form which is not suitable for their type of model (Hyde & Perloff, but the same critical observation was advanced by Panzar & Rosse). Finally, we can also apply to our case the critical observations of Boyer (Boyer, 1996) toward the structural model: it is an oligopoly model, meaning that it assumes that the market power is an industry dimension and not a firm's one. Due to all these reasons - absence of data for specifying the structural model, inadequacy of the reduced form - we have to follow a transversal way, as it is proposed by Carlton & Perloff (1994).
We propose the following method for measuring the presence of market power of firms in an industry with scale economies. The presence of market power should give place to higher prices and consequently higher profits, but the critical question is "higher than what"? *Higher than the expected profits as a function of the scale economies in such an industry***.** If we accept the hypothesis that scale economies represent the main characteristic of this industry and that there are no important possibilities of higher efficiency for a firm in the industry, then we can propose to identify the market power of a firm in the following way:
- Test a measure of the scale economies in the industry, as we did in the previous section;
- Find and test through a regression model the relation between profit variables and the firms' size in the industry (excluding the firm taken into consideration);
- Estimate the expected profit value for a firm, which has the same sales as that of the firm under examination;
- Compare the estimated values and the real ones: a significant deviation (in the econometric meaning) in favour of the real value shows the presence of market power. This deviation represents the monopoly power of our examined firm.

Demsetz (1982) in his article on the entry barriers explains that "the equalization of profit rates through competition, however, is a proposition logically valid only with respect to investment on the *margin*[11] of alternative economic activities. Only if all inputs are available in perfectly elastic supply does this imply equality between average profit rates" (p. 47). Later in the same text, the author specifies that "a barrier to competitors may arise from the superior efficiency of existing firms, in which case their low prices are precisely what competitive markets are expected to bring forth" (p. 52). We have to accept the likelihood of the argument of Demsetz and of the Chicago school. Access conditions to the inputs and superior effectiveness can be the reason for higher profits, which do not indicate, in that case, the presence of market power. Here the access to inputs conditions are *a priori* the same for all the actors. On the contrary, the hypothesis of the difficulty to realize efficiency significantly superior to the

[11] Underlined by the author.

average efficiency is fundamental for our scope. The arguments are of two types here: on one side the software firms are small sized and the Libenstein "X inefficiencies" have low possibility of existence. On the other side, a superior efficiency, if it does exist, can be present only in the software conception/production, identified as an R&D activity of the sector's firms. Cohen et al (1987, 1989) and Cohen (1985) have shown in their works that the large firm's advantages in innovation, measured by the R&D/sales ratio, are not significant, because there is no correlation between R&D expenditures and sales. It is necessary to look at the consequences of the different hypotheses: a large firm's advantage should be translated into a weaker R&D/sales ratio, in respect to the small and medium sized firms. The same, a disadvantage should be translated into a R&D/sales ratio higher for the large firms than for the small and medium ones. What happens in the software industry case? This industry is characterized by a low variance of R&D ratio (see the next paragraph). As for the R&D/sales ratio, Microsoft is very close to the average in the third quartile. In this case it isn't possible to refer to a superior efficacy.

One of the main arguments of the theoreticians of the new economy is the well known Schumpeter paradigm. Innovation, being a risky activity, has the right to benefit from a temporary monopoly position. The issue is *a priori* contradictory, since monopoly prevents innovation, following the same Schumpeter. There is therefore a tension between monopoly and innovation on one side and competition and innovation on the other side. The innovation dynamics (which is the capitalism dynamics, in Schumpeter) should follow the pattern: innovation1- monopoly1- competition-innovation2- monopoly 2, etc.

From the welfare point of view, monopoly time is a lost time. But this time is a necessity, otherwise there would be a low or very low level of innovation. How long can this monopoly time last? One usually explains that new technology sectors are characterised by high dynamics and that monopoly length is between three and five years, which is conform to the accepted idea of a return on a risky investment. Is this the case for Microsoft? Our database includes 10 years and we take this length of time as sufficiently long for reasonably measuring the monopoly or not monopoly of Microsoft position[12].

[12] Teece & Coleman (1998) and Pleatsikas & Teece argue that a ten years length of time is reasonable to evaluate a market power position.

b) The measures of Microsoft market power

- Database:

We used the same database as before. It contains, among other things, the following variables: sales, R&D, net income (NI), operating income (OI) and shareholder's equity (SE). The descriptive statistics for one year are the following (table 4):

Table 4 Year 2000 in percentage

N=34	NI/sales	OI/sales	SE/sales	R&D/sales
Mean	7.2	10.0	79.2	16.1
Standard deviation	14.1	15.2	42.5	5.5
Median	8.6	9.6	69.6	15.5
Maximum	41.0	47.6	189.3*	29.4
Minimum	- 30.4	- 20.2	- 1.7	5.1
Microsoft	41.0	47.6	180.2	16.4

* Intuit invested in start up and includes the value of these assets in shareholders' equity.

- Relations between profit and turnover

We used three variables for profit with the aim of increasing the range of assumptions, if any: net income (NI), operating income (OI) and stockholder equity (SE). Stockholder equity has a special significance in the software industry: generally firms do not distribute any profit to their shareholders and stockholder equity represents a good estimation of past profits. The choice of the scale economies is the following:

Years 1998 – 2003: 1.16

Years 1994 – 1997: 1.10

In the previous paragraph, 1.16 represented the average of the yearly SCE (scale economies) for the period 1998-2003. The average scale economies for 1994-1997 were 1.04. We chose a margin higher than 5% for these years because the number of firms is lower, i.e. a SCE value of 1.10.

The estimated regressions have the following form:

NI= a + bSalespower + e with Salespower = salespowerSCE

OI = a+ bSalespower + e with Salespower = salespowerSCE

SE = a+ bSalespower + e with Salespower = salespowerSCE

Table 5 gives the results of regressions with operating income over the 10 years (t value between brackets). B is always significant. Despite the elementary nature of the model, the estimate appears to be robust. Same results are obtained with net income and shareholders equity (*Cf.* annexe).

Table 5 Estimations of Operating Income

Year	A	B	R2	N
2003	-153	0.0777*	0.905	33
	(-3.1)	(16.9)		
2002	- 167	0.0726*	0.868	34
	(-3.3)	(14.3)		

2001	- 251 (-3.1)	0.0747* (8.7)	0.711	34
2000	- 155 (-2.5)	0.0668* (10.8)	0.783	35
1999	- 93 (-3.0)	0.0696* (20.8)	0.923	39
1998	- 34 (-1.5)	0.0529* (19.3)	0.921	35
1997	- 69 (-1.3)	0.109* (8.8)	0.727	32
1996	- 48 (-2.3)	0.103* (17.1)	0.919	29
1995	- 3 (- 0.1)	0.0637* (4.6)	0.501	23
1994	- 26 (-1.4)	0.103* (12.4)	0.874	25

t-ratios in parentheses; *:p < 0,001

- Values of profit for a turnover equal to the one of Microsoft (table 6) :

One has to compute the estimated values from the regression formula and the 95% confidence interval. Let us recall that the more a point is faraway from mean, the larger the confidence interval. Table 6 gives the expected results of Microsoft.

Table 6 Microsoft: Expected Results

Year	Expected NI	Expected OI	Expected SE
2003	8778 ± 1301	13009 ± 1613	27586 ± 5584
2002	5974 ± 1507	10447 ± 1544	19457 ± 4988
2001	5322 ± 1827	9320 ± 2243	17425 ± 4252
2000	4966 ± 1307	7491 ± 1544	15495 ± 3681
1999	2918 ± 720	6593 ± 717	15952 ± 2685
1998	2280 ± 370	3513 ± 433	6979 ± 1199
1997	1912 ± 535	3081 ± 840	5388 ± 938
1996	1199 ± 238	2163 ± 308	3845 ± 918
1995	920 ± 345	1378 ± 487	3000 ± 740
1994	743 ± 138	1089 ± 215	2638 ± 478

Millions of dollars

- Comparison between expected and actual (table 7) :

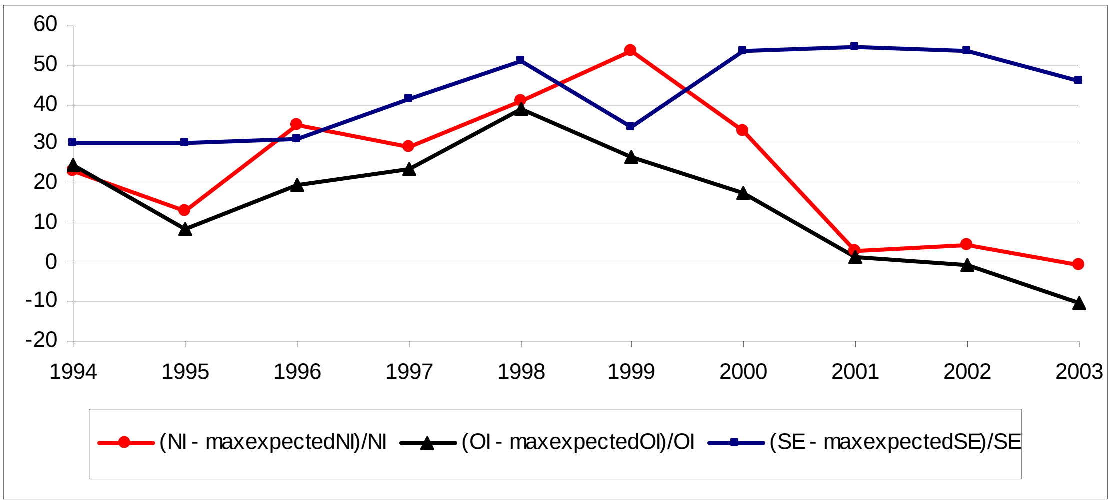
Table 7 Microsoft: Actual Results

Year	NI	OI	SE
2003	9993	13217	61020
2002	7829	11910	52180
2001	7346	11720	47289
2000	9421	10937	41368
1999	7785	9928	28428

1998	4490	6414	16627
1997	3454	5130	10777
1996	2195	3078	6908
1995	1453	2038	5333
1994	1146	1726	4450

Sources: Form 10K; millions of dollars.

Figure 1 Relative difference from the upper bound of the confidence interval



In 27 cases out of 30, Microsoft is outside the 95% confidence interval. The three cases where Microsoft is in our interval are net income in 2003 and operating income in 2003 and 2002. Net income (NI) and Operating Income (OI) follow the same trend of marginally decreasing surplus returns compared with the rest of the industry from the beginning of the 2000. Stockholder Equity is still 50% higher than expected, showing the continuity and strength of the profit engine that has become Microsoft. Globally, from 1994 to 2003 Microsoft earned 55 billions of net income and should have earned 35 billions if it had no market power. In another way, 36% of Microsoft's net incomes are monopole profits. But we must recognize that these monopolistic profits have been diminishing for two or three years. Has Schmalensee's prophecy been realised? Where could it come from while the Internet browsers and Java competition never arrives and while the dominant position of Microsoft on his two main markets (operating systems for micro and personal productivity) has not been challenged? Different reasons might explain this marginal decline of Microsoft's profitability (table 9).

Table 9 Microsoft: Income Statements

	2003	2002	2001	2000
Turnover	32187	28365	25296	22956
Cost of sales	5686	5191	3455	3000
R&D	4659	4307	4379	3772
Sales & marketing	6521	5407	4885	4126
General & administrative	2104	1550	857	1050

Operating income	13217	11910	11720	10937
Investment income	1577	- 305	- 36	3326
Net income	9993	7829	7346	9421
Employment	55000	50500	47600	39100

Sources: Form 10K, millions of dollars

The data of these last few years can be analysed as follow:

- Organisational slack and investment into new sectors (the accounts of the firm do not allow us to distinguish between these two distinct phenomenona). For several years Microsoft has been investing into Consumer Electronics (home and entertainment) with its MSN network and game consoles (Xbox). This can explain the growth of the items Cost of Sales and Sales & Marketing. Microsoft announced losses of 1 billion dollars in the year 2000, 1.7, 1.8 and 1.4 for the years 2001, 2002, 2003 in the consumer electronic sector (Form 10K). The high profits on monopole activities allowed Microsoft to finance its strategic diversification, whatever the price.
- Monopole costs: Microsoft has to pay for the costs of the anti-trust lawsuits. These costs include lobbying, files and fees and are computed into the General & Administrative item. Difficult to evaluate, they represent between 200 and 600 millions de dollars a year from 1998 to 2003 and they are growing (*Form 10K*). For three years, one has to add compensations that Microsoft paid to competitors to avoid justice trials. These compensations were 660 millions of dollars in 2002 and 1 billion dollars in 2003 (of which 750 millions to AOL-TimeWarner).
- Strategic management of provisions: Microsoft has a cash flow of several tens of billions of dollars. It depreciated telecommunications investments for the years 2001 and 2002.

For the years 2000, Microsoft sustained higher costs. These costs are direct and indirect monopole costs. These costs taken aside, Microsoft is still largely outside the 95% confidence interval.

c) Discussion

Our model is very simple and there are other sources of extra-profits than scale. The analysis we present is mainly adapted to horizontal single markets[13]. The software industry is subject to scope economies, either vertical (for instance between operating systems and application software) or horizontal (for instance between diverse modules of an ERP package). Let us note that our representation and calculus of scale economies implicitly include scope economies although we are not able to control for that. This can induce a small bias against Microsoft.

On the other side, our sample has a bias in favour of Microsoft. It is based on the 35 first firms of the industry. These firms can themselves benefit from market power. If the global concentration ratio can be seen to be weak - C4 of about 26% in 1998 – the software industry shares with the pharmaceutical industry the fact that this kind of measure makes no sense because these industries are « natively » differentiated. We know that in the pharmaceutical industry, there exist 10 families of disease with

[13] We are grateful to an anonymous referee for pointing out this point to us.

appropriate medicines. The competition between these families of medicine does not exist. The situation is the same in the software industry: an antivirus software is not in competition with a statistical package. From an industrial economic perspective, it is the concentration by family that makes sense and the latter is often high (Genthon, 2004). The other firms of our sample can then be in an oligopolistic position and benefit themselves from market power. What we measure is the extra market power of Microsoft in comparison to the market power of the other firms of our sample. In realty, our measures reduce the market power of Microsoft.

Conclusion

We tried to identify the market power of Microsoft from an empirical work based on industrial data. We tried to show that this market power is long standing. Our measures tend to show that Microsoft obtains more profit that the structural conditions of the industry allow it to benefit. The results do not depend of the precise measures of the economies of scale and seem statistically robust. This comes from the enormous market power Microsoft benefit. Does it use and abuse it? This question is outside the scope of this study.

ANNEXE

Table A1 Estimations of Net Income

Year	a	b	R2	N
2003	-98	0,0524*	0,869	33
	(-2,4)	(14,1)		
2002	-106	0,0416*	0,694	34
	(-2,2)	(8,4)		
2001	-170	0,0429*	0,550	34
	(-2,6)	(6,2)		
2000	- 98	0,0442*	0,695	34
	(-1,8)	(8,4)		
1999	- 23	0,0306*	0,650	37
	(-1,0)	(7,9)		
1998	- 25	0,0344*	0,870	35
	(-1,2)	(14,6)		
1997	-47	0,0678*	0,718	32
	(-1,4)	(8,6)		
1996	-23	0,0569*	0,851	28
	(-1,4)	(12,0)		
1995	3,8	0,0404*	0,447	24
	(0,1)	(4,1)		
1994	- 20	0,0705*	0,891	25
	(-1,7)	(13,4)		

t-ratios in parentheses; * : p < 0,001

Table A2 Estimations of stockholder equity

Year	a	b	R2	N
2003	653	0,159	0,768	33
	(3,8)	(10,0)		
2002	585	0,129	0,666	34
	(3,6)	(7,9)		
2001	516	0,132	0,681	34
	(3,4)	(8,1)		
2000	501	0,131	0,677	34
	(3,0)	(8,1)		
1999	285	0,163*	0,759	39
	(2,0)	(10,6)		
1998	270	0,100*	0,853	34
	(4,2)	(13,4)		
1997	216	0,179	0,856	31
	(3,7)	(12,9)		
1996	194	0,170*	0,778	28
	(3,1)	(9,4)		
1995	127	0,203*	0,814	24
	(2,0)	(9,6)		
1994	64	0,238	0,882	25
	(1,6)	(12,8)		

t-ratios in parentheses; * : p < 0,001

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